

REMARKS/ARGUMENTS

Status of the Claims

Claims 1-5, 7-9, and 11-32 are pending in the application, among which claims 26-31 have been withdrawn from consideration in view of the prior Election Requirement. Claim 1 is the only independent claim. Claims 6 and 10 have been previously cancelled without prejudice or disclaimer. No claim has been amended herein.

Overview of the Office Action

Claims 1, 3-4, 7-8, 11, 15-16, 19, 21-25, and 32 have been rejected under 35 U.S.C. §103(a) as unpatentable over Kuan (US 6,860,620).

Claims 2, 9, 12-14, 17-18, and 20 have been rejected under 35 U.S.C. §103(a) as unpatentable over Kuan.

Claim 5 has been rejected under 35 U.S.C. §103(a) as unpatentable over Kuan and further in view of Becker (US 7,273,987).

Brief Discussion of the Cited Art

Kuan teaches a device, in which a thermally conductive layer includes a heat sink track 122 (see, e.g., Fig. 4 of Kuan). The heat sink tracks 122, 125 in Kuan occupy only a small area of the plane, on which the heat sink tracks 122, 125 and the electrical tracks 121, 123, 124, 126 are arranged. The anode and cathode terminals of a corresponding LED are attached to the corresponding electrical tracks 121, 123, 124, 126 (see, e.g., col. 3, ll. 29-35). As Fig. 4 of Kuan shows, the heat sink tracks 122, 125 are arranged between the electrical tracks 121, 123, 124, 126 and are parallel to the corresponding anode and cathode tracks 121, 123, 124, 126 (see, also, col. 3, ll. 65-67). As such, the distance between the anode and cathode terminals of Kuan's LED limits the space available for the heat sink tracks 122, 125.

Patentability of the Claimed Invention

A. Independent Claim 1

Independent claim 1 recites a light emitting diode arrangement including a flexible circuit board, in which *“the thermally conductive layer and the electrical conductor tracks are positioned in a same plane of the flexible circuit board”* and *“the thermally conductive layer occupies at least 60 % of an area of said same plane.”*

In the subject application, the flexible circuit board (10) includes both electrical conductor tracks (22) and a thermally conductive layer (21). The thermally conductive layer (21) occupies at least 60% of an area of a plane, in which both the thermally conductive layer (21) and the electrical conductor tracks (22) are positioned.

(i)

The Office Action acknowledges that Kuan does not disclose the thermally conductive layer comprising 60% of an area of said plane (see pg. 2 of the Office Action). The Office Action finds that element 108 of Kuan is provided to increase the heat removal from the device and asserts that the larger the total area of elements 122, 125 and 108, the better will be the heat removal rate (see pgs. 2-3 of the Office Action). While acknowledging that Kuan's drawing figures are not drawn to scale, the Office Action nevertheless interprets Kuan's drawing figures as teaching most of Kuan surface area being occupied by elements 122, 125 and 108. *Id.*

Applicants disagree with the Examiner's interpretation of Kuan made in the Office Action. As explained in more detail below, the drawings of Kuan may not be relied on to show the percentage area of the heat sink tracks 122, 125, 108 in relation to the flexible substrate 103, because Kuan is silent with respect to a particular percentage area and does not specify that the drawings are to scale.

Under U.S. patent practice, patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue. More specifically, MPEP § 2125 sets forth the following:

When the reference does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on measurement of the drawing features are of little value. See *Hockerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000) (The disclosure gave no indication that the drawings were drawn to scale. "[I]t is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue.").

In this case, Kuan is silent about the percentage area of the heat sink tracks 122, 125, 108 in relation to the flexible substrate 103. In addition, Kuan does not state that its drawings are to scale. Pursuant to MPEP § 2125, the assertion made in the Office Action that most of Kuan's flexible substrate 103 is occupied by elements 122, 125 and 108 cannot be sustained. Accordingly, the Office Action fails to establish a *prima facie* obviousness case against independent claim 1.

In fact, Fig. 4 of Kuan appears to show that most of Kuan's flexible substrate 103 is not occupied by elements 122, 125 and 108 and thus be contradictory to the interpretation of Kuan made in the Office Action. Consequently, the interpretation of Kuan made in the Office Action contradicts to what is depicted in the drawing figures of Kuan.

Therefore, Kuan does not teach or suggest that "*the thermally conductive layer and the electrical conductor tracks are positioned in a same plane of the flexible circuit board*" and "*the thermally conductive layer occupies at least 60 % of an area of said same plane,*" as expressly recited in independent claim 1. Independent claim 1 thus patentably distinguishes over Kuan and is allowable for the above additional reasons.

(ii)

The Office Action also asserts that the above-recited claim features of independent claim 1 are merely optimum or working ranges which can be obtained through routine skill in the art based on the general conditions taught by Kuan (see pg. 3 of the Office Action). Applicants disagree with the above assertion made in the Office Action because Kuan fails to recognize the result of an area ratio of the combined elements 122, 125, 108 to the flexible substrate 103 as a result-effective variables. Thus, it would not be obvious for one skilled in the art to optimize such an area ratio to arrive at the claimed invention based on the following detailed reasons.

Section 2144.05 of MPEP sets forth the following:

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.).

In this case, Kuan does not discuss the result of an area ratio of the combined elements 122, 125, 108 to the flexible substrate 103. The Examiner-cited portions of Kuan merely teach a metal frame 108 in contact with the heat sink tracks 122, 125, so that heat from the LEDs 102 – 102n is transported to the metal frame 108 via the heating sink tracks 122, 125 (see col. 4, ll. 1-8 of Kuan). There is no teaching concerning a surface area of either the elements 122, 125, 108 or the flexible substrate 103, much less the area ratio of the combined elements 122, 125, 108 to the flexible substrate 103. Without the recognition of such an area ratio as a result-effective variable, it would not be obvious for one skilled in the art to optimize the area ratio of the combined elements 122, 125, 108 to the flexible substrate 103, in order to arrive at the claimed invention recited in independent claim 1.

Therefore, Kuan does not teach or suggest that “*the thermally conductive layer and the electrical conductor tracks are positioned in a same plane of the flexible circuit board*” and “*the thermally conductive layer occupies at least 60 % of an area of said same plane,*” as expressly recited in independent claim 1. Independent claim 1 thus patentably distinguishes over Kuan and is allowable for the above additional reasons.

In view of the foregoing, the claim rejection of independent claim 1 has been overcome.

B. Dependent Claims 2-5, 7-9, and 11-32

Claims 2-5, 7-9, and 11-32 depend, directly or indirectly, from allowable independent claim 1. Becker was not cited to cure the deficiencies of the primary reference discussed above but to show additional limitation. Even if Becker was to show the additional limitations it is purported to show, the additional limitations do not cure the deficiencies of Kuan discussed above. Therefore, claims 2-5, 7-9, and 11-32 are each allowable for at least the same reasons that independent claim 1 is allowable.

In addition, these dependent claims include features that serve to even more clearly distinguish the claimed invention over the prior art of record. For example, claims 12-14 further recite an insulating layer. The Office Action states that providing a solder mask on a board is old and known in the art to protect the surface from environmental damage (see pg. 8 of the Office action). Applicants disagree. Firstly, Kuan teaches that the tracks 121 to 126 can have a multilayer structure where the upper layer is made of gold (see, e.g., col. 3, ll. 50-64 of Kuan). As is known to one skilled in the art, gold is chemically inert and does not require protection by a solder mask. Moreover, applying an additional layer, such as the claimed insulating layer on the flexible circuit board would contradict the intention of Kuan, which is to provide a rather thin arrangement (see, e.g., col. 5, ll. 5-10 of Kuan). Consequently, regardless whether a solder mask is “old and known in the art,” there is no motivation for one skilled in the art to provide an

insulating layer for Kuan's device, as is proposed in the Office Action based on impermissible hindsight with the knowledge of applicants' invention. Therefore, claims 12-14 are each allowable for the above additional reasons.

Conclusion

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited. Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

No fees or charges are required at this time in connection with the subject application. If any fees or charges are required, they may be charged to the PTO Deposit Account No. 03-2412.

Respectfully submitted,
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